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EXAMINER

DEO, DUY VU NGUYEN

ART UNIT

PAPER NUMBER

1765

DATE MAILED: 08 13 2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/063,131

Applicant(s)

HUANG ET AL.

Examiner

DuyVu n Deo

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 March 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 March 2002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 recites the limitation "the acid solution dipping process." There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 1, 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Kim et al. (US 6,461,937).

Kim describes a method for forming trench isolations comprising: providing a substrate (col. 5, line 42); forming a silicon nitride 104 on a pad oxide layer 102, patterning the silicon nitride layer and etching trench in the substrate (col. 5, line 40-65), since the pad oxide must be patterned before the substrate can be patterned, therefore the pattern of silicon nitride and pad oxide would read on claimed a trench-patterned mask layer on top surface exposing an unmasked trench region of the substrate (figure 7); depositing a HTO film over the substrate (col. 6, line 27-30), this layer would also covering the trench and the mask layer; depositing a dielectric layer 114 to fill the trench and this would have to cover the HTO film (col. 6, line 39-41); planarizing the dielectric layer 114 using the silicon nitride 104 as the planarization-stop layer (col. 6, line 55-58), this silicon nitride layer would have to be exposed in order for it to be the stop layer or stop the planarizing step; stripping the silicon nitride layer (col. 7, line 13-15).

Since the oxide layer is the same layer, HTO layer, as that of the claimed invention, this oxide film would also reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams being formed during an acid solution dipping process.

Referring to claim 4, the dielectric layer is a HDP oxide layer (col. 6, line 43).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

Art Unit: 1765

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied to claim 1 above, and further in view of Freiburger et al. (US 5,104,819).

Unlike claimed invention, Kim doesn't describe the processing parameters to form a 50-250 angstrom HTO film. Freiburger describes a method for depositing a high temperature oxide using N₂O, SiCl₂H₂, a pressure of 0.4 torr, temperature of 775 degree Celsius, and having a 100 angstrom thickness (col. 7, line 5—10, line 35-40). It would have been obvious for one skill in the art to modify Kim in light of Freiburger because Freiburger further describes specific processing parameters that are silent by Kim in order to form an oxide layer with a reasonable expectation of success.

7. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park et al. (US 5,858,858) and Freiburger et al. (US 5,104,819).

Park describes a method for forming isolation trenches comprising: providing a semiconductor substrate which must have a top surface (col. 3, line 12); providing a pattern of pad oxide and a nitride layer (known in the art as silicon nitride, please also see page 2, line 1, 2 of the specification), the pattern exposes an unmasked trench region of the substrate, these layers of oxide and nitride read on claimed a trench-patterned mask layer on the top surface (col. 3, line 15-31); etching the unmasked region of the substrate to form a trench in the substrate (col. 3, line 32-34); growing an oxide layer over the substrate covering the trench and mask layer (col. 3, line 35-38); depositing an insulating layer (dielectric layer) to fill the trench and cover the oxide layer (col. 3, line 39-42); planarizing the insulating layer to expose the nitride layer (col. 3, line 52-

Art Unit: 1765

54); stripping the nitride layer (col. 3, line 60-61). Unlike claimed invention, Park doesn't describe growing the oxide layer by depositing a high temperature oxide film. Freiburger describes a method for depositing a high temperature oxide using N_2O , $SiCl_2H_2$, a pressure of 0.4 torr, and temperature of 775 degree Celsius (col. 7, line 5—10, line 35-40). It would have been obvious for one skill in the art to modify Park in light of Freiburger because Freiburger further describes specific processing parameters that are silent by Park in order to form an oxide layer with a reasonable expectation of success.

Since the oxide layer is formed by the same method as the claim by LPCVD with the same processing parameters, this oxide film would also reinforces an interface between the dielectric layer and the substrate to prevent acid penetration and acid-corroded seams being formed during a acid solution dipping process.

Referring to claim 3, Freiburger describes the oxide is formed with a thickness of 100 angstrom (col. 7, line 10).

8. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Park/Freiburger or Kim as applied to claim 1 above, and further in view of admitted prior art.

Referring to claims 5 and 6, applied prior art doesn't describe performing a silicon oxide etching process to remove residual oxide on the nitride layer and simultaneously etch the dielectric layer of the trench using DHF solution. Admitted prior art (pages 2 and 3 of specification) teaches a same conventional process of forming trench isolation where it describes performing a silicon oxide etching process to remove residual oxide on the nitride layer and simultaneously etch the dielectric layer of the trench using DHF solution. It would have been

Art Unit: 1765

obvious for one skill in the art to modify applied prior art in light of admitted prior art because it teaches that this step is performed in order to clean the substrate (page 2, paragraph [0008]).

9. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park/Freiberger or Kim as applied to claim 1 above, and further in view of Cheng et al. (US 6,541,382).

Referring to claim 7, applied prior art is silent about removing the nitride by a 160 degrees Celsius phosphoric acid solution. Cheng teaches a same method of forming trench isolation where he teaches of removing the nitride layer using a phosphoric acid solution having T of 160-180 degrees Celsius (col. 6, line 20-21). It would have been obvious at the time of the invention for one skill in the art to modify applied prior art in light of Cheng's teaching of nitride etching solution because Cheng further describes specific etchant and its T, which are silent by applied prior art, to remove nitride with a reasonable expectation of success.

10. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Park and Freiberger as applied to claim 1 above, and further in view of Chung (US 6,548,374).

Unlike claimed invention, applied prior art doesn't describe the dielectric layer is formed by HDP method. Chung describes a same method of forming trench isolation where he teaches filling the trench using HDP method to form HDP oxide layer (col. 7, line 35-45). It would have been obvious for one skill in the art to modify applied prior art in light of Chung because Chung teaches that the HDP oxide layer enhances the gap-filling capability so not to cause leaks or voids inside the trenches (col. 7, line 43-45).

Double Patenting

11. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or

Art Unit: 1765

improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

12. Claims 1-7 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 3-7 of copending Application No. 10/063132 (referring to as '132) in view of Freiberger et al. (US 5,104,819).

Claims 1, 3-7 of application '132 describes substantially same steps as that of claims 1, 3-7. Unlike claimed invention, referring to claims 1 and 2, claims of application '132 do not describe growing the oxide layer by depositing a high temperature oxide film. Freiberger describes a method for depositing a high temperature oxide using N₂O, SiCl₂H₂, a pressure of 0.4 torr, and temperature of 775 degree Celsius (col. 7, line 5—10, line 35-40). It would have been obvious for one skill in the art to form the oxide layer in light of Freiberger because Freiberger describes an alternative method in order to form an oxide layer having a same thickness with a reasonable expectation of success.

This is a provisional obviousness-type double patenting rejection.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
July 30, 2003

Gia